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(54) **Personal identification device and method**

(57) A personal identification device (100) for executing personal identification by employing living body characteristics of an user includes an identification condition data reading means (70) for reading identification condition data specifying at least one living body characteristics stored in a portable storage media (200) carried by the user for the personal identification, a living body characteristic detecting means (20, 30, 40) for detecting from the user the living body characteristic corresponding to the identification condition data read by the identification condition data reading means, and an identifying means (90) for performing personal identification by comparing the living body characteristic detected by the living body characteristic detecting means with the living body characteristic data of users previously obtained.

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## Description

## SUMMARY OF THE INVENTION

## BACKGROUND OF THE INVENTION

## 1. Field of the Invention

[0001] This invention relates to a personal identification device and method for executing personal identification by employing living body characteristics such as a finger print, a voice print, a face or the like, and more particularly to an improved personal identification device and method for executing personal identification by specifying living body characteristics to be used for personal identification based on the identification condition data stored in a portable storage media such as an IC card or the like carried by an user.

## 2. Description of the Related Art

[0002] There is well known a personal identification device for executing personal identification by employing living body characteristics such as a finger print, a voice print, a face or the like, which is employed in a car navigation, a notebook personal computer, an electronic note, and various mobile machines. The conventional personal identification device previously stores therein the data representing plural living body characteristics (hereinafter called as io-data\*), such as finger print data of a specific finger, voice print data, and face-image data of an user. As the device is actuated, it compares the previously stored bio-data with the bio-data taken from the user to execute personal identification, whereby unauthorized use by other person is prevented. The conventional personal identification device, however, is designed for a single living

body characteristic item. A conventional finger print identification terminal is designed only for identification by a finger print, a conventional voice print identification terminal is designed only for identification by a voice print, and an image identification terminal is designed only for identification by a face. Thus conventional personal identification device designed for such a single living body characteristic item cannot be sometimes used by a handicapped person or an injured person and execute any precise personal identification.

[0003] Though there has been proposed heretofore a personal identification device focused on plural living-body characteristics of an user, it is composed of a plurality of identification terminals, such as combination of a finger print identification terminal and a voice print identification terminal or combination of a voice print identification terminal and an image identification terminal, in which the living body characteristics for personal identification is fixed thereby lacking the degree of freedom and the device is bulky.

[0004] It is, therefore, a primary object of this invention to provide a personal identification device and method capable of executing personal identification employing a plurality of living body characters with high security in accordance with the need by users.

[0005] According to a first aspect of this invention, there is provided a personal identification device for executing personal identification by employing living body characteristics of a user which includes an identification condition data reading means for reading identification condition data specifying at least one living body characteristics stored in a portable storage media carried by the user for the personal identification, a living body characteristic detecting means for detecting from the user the living body characteristic corresponding to the identification condition data read by the identification condition data reading means, and an identifying means for performing personal identification by comparing the living body characteristic detected by the living body characteristic detecting means with the living body characteristic data of users previously obtained, whereby the personal identification employing plural living body characteristics in accordance with the need by users may be performed and high security is realized.

[0006] According to a modification of the personal identification device of the first aspect, the portable storage media stores therein an identification algorithm for personal identification employing the living body characteristics together with the living body characteristic data, and the identifying means performs the personal identification by transferring the living body characteristics detected from the user by the living body characteristic detecting means to the portable storage media, whereby the personal identification may be performed even when any identification algorithm about living body characteristic data does not exist in the device itself.

[0007] According to another modification of the personal identification device of the first aspect, the portable storage media stores therein the living body characteristic data, the identification condition reading means reads the living body characteristic data from the portable storage media together with the identification condition data, and the identifying means performs the personal identification by comparing the living body characteristics detected from the user by the living body characteristic detecting means with the living body characteristic data read from the portable storage media, whereby the device itself is not necessary to store any living body characteristic data to be compared and the personal identification employing plural living body characteristic data may be performed with large degrees of freedom.

[0008] According to a second aspect of this invention, there is provided a personal identification apparatus for performing personal identification by employing living body characteristics of a user having a central

device, and a plurality of personal identification terminals each of which includes an identification condition data reading means for reading identification condition data specifying at least one living body characteristics stored in a portable storage media carried by a user, a living body characteristic detecting means for detecting from the user the living body characteristic corresponding to the identification condition data read by the identification condition data reading means, an identifying means for performing personal identification by comparing the living body characteristic detected by the living body characteristic detecting means with the living body characteristic data of users obtained previously, and a communicating means for communicating with the central device, whereby the personal identification employing plural living body characteristics in accordance with the need by users may be performed by a central management.

**[0009]** According to a modification of the personal identification apparatus of the second aspect of this invention, the center device stores and manages the living body characteristic data for each user, revises the living body characteristic data for each user stored and managed by communication with each of the personal identification terminals, and generally controls identification results of users from the personal identification terminals, whereby centralized management also may be performed about the living body characteristic data used for personal identification.

**[0010]** According to a third aspect of this invention, there is provided a personal identification method for detecting living body characteristics of a user to compare the detected characteristics with the living body characteristic data previously obtained about the user to execute personal identification, which includes the steps of storing identification condition data specifying at least one living body characteristics for the personal identification into a portable storage media carried by the user and detecting living body characteristic corresponding to the identification condition data read from the portable storage media from the user to execute the personal identification, whereby the personal identification employing plural living body characteristics in accordance with the need by users may be performed and high security is realized.

#### BRIEF DESCRIPTION OF THE DRAWINGS

**[0011]** Other objectives and advantages of this invention will be more readily apparent from the following detailed description provided in conjunction with the following figures, of which:

Fig. 1 is a perspective view of a personal identification device according to a preferred embodiment of this invention;

Fig. 2 is a schematic block diagram of the device of Fig. 1;

Fig. 3 is one example of information stored in an IC card shown in Figs. 1 and 2;

Fig. 4 is another example of information stored in the IC card shown in Figs. 1 and 2; and

Fig. 5 is a flow chart showing a personal identification operation in the personal identification device of Figs. 1 and 2

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

**[0012]** Referring, now, to Fig. 1, there is shown a personal identification device 100 for performing personal identification employing data representing plural living body characteristics of a user (bio-data), such as finger print data of a particular finger, voice print data, and image data of a face of the user, according to a preferred embodiment of this invention, which includes a CCD sensor 20 taking finger print data of a particular finger of a user, a microphone 30 taking voice print data of the user, and a video camera 40 taking image data of a face of the user. The device 100 further includes an input-and-display panel 10 to enter and display various information and an insertion opening 50 to be installed by the IC card 200 playing as a portable storage media carried by the user.

**[0013]** The personal identification device 100 of this embodiment is designed to store identification condition data specifying at least one living body characteristics for personal identification into the IC card 200 carried by the user and detect the living body characteristics from the user corresponding to the identification condition data read from the IC card 200. The identification condition data is the data that specifies living body characteristics (hereinafter called as io\*) used for personal identification, and read from the IC card 200 by the personal identification device 100 to determine the bio for performing personal identification of the user based on the identification condition data. In the personal identification device 100 there are set four kinds of bio usable for personal identification which are a finger print of a particular finger of a user, a voice print, an image of a face, and signature. The identification condition data is the data showing selection of one or more among the four kinds of bio.

**[0014]** Fig. 2 is a schematic block diagram of the personal identification device 100 of this embodiment which includes the input-and-display panel 10, the CCD sensor 20, the microphone 30, and the video camera 40 as shown in Fig. 1, and further includes a peripheral controller 60, an IC card read-and-writer (IC card R/W) 70, a memory 80, and a central processing unit (CPU) 90. The peripheral controller 60 is connected with a central device 300 through a line 301 by cable or wireless.

**[0015]** The input-and-display panel 10 is provided with a liquid crystal display (LCD) 10-1 and a touch panel 10-2 mounted on the liquid crystal display 10-1, thereby providing a display function and an input func-

tion about various information. The CCD camera 20 is connected with the peripheral controller 60 to read finger print data based on the finger print of a particular finger of a user as one bio used by the personal identification device 100 under the control by the peripheral controller 60. The microphone 30 is connected with the peripheral controller 60 to take voice print data corresponding to the voice print of the user as one bio used by the personal identification device 100 under the control by the peripheral controller 60. The video camera 40 is connected with the peripheral controller 60 to take image data corresponding to a face of the user as one bio used by the personal identification device 100 under the control by the peripheral controller 60.

**[0016]** The peripheral control unit 60 is connected with the CCD camera 20, the microphone 30, the video camera 40, the IC card R/W 70, the CPU 90, and the input-and-display panel 10 to control the entry of the finger print data, the voice print data and the image data of face by the CCD camera 20, the microphone 30 and the video camera 40, the read-and-write operation of the data from the IC card 200 by the IC card R/W 70, and the information input and display operation by the input-and-display panel 10, respectively.

**[0017]** The peripheral control unit 60 is also connected with the central device 300 through the line 301 to transmit and receive various data by the communication with the central unit 300. The central device 300 manages the storage of the bio data for each user, revises the bio data for each user to be stored and managed by the communication with the personal identification device 100, and generally controls results of the identification of the users by the device 100.

**[0018]** The memory 80 stores therein a control program to operate the CPU 90, and various information to control the personal identification device 100. The CPU 90 is connected with the peripheral controller 60 and the memory 80 generally to control the operations of the respective portions of the personal identification device 100 through the peripheral controller 60 based on the information stored in the memory 80.

**[0019]** Fig. 3 shows one example of the information stored in the IC card 200 of Figs 1 and 2 which stores therein a bio execution condition table 201, a finger print bio mounting table 202, a voice print bio mounting table 203, a face bio mounting table 204, a finger print oneself data 205, a voice print oneself data 206, and a face oneself data 207. The bio execution condition table 201 stores therein the above-described identification condition data. The finger print bio mounting table 202, the voice print bio mounting table 203, and the face bio mounting table 204 respectively store therein the data for mounting and not-mounting the finger print oneself data 205, the voice print oneself data 206, and the face oneself data 207. These data consist of two values of [1] representing mounting of the corresponding bio data and [0] representing not mounting of the corresponding bio data.

**[0020]** The finger print oneself data 205 is finger print data corresponding to the finger print of a particular finger of a user which is previously taken and registered from the user oneself. The voice print oneself data 206 is voice print data corresponding to the voice print of the user which is previously taken and registered from the user oneself. The face oneself data 207 is image data corresponding to the face image of the user that is previously taken and registered from the user oneself.

**[0021]** Fig. 4 shows another example of the information stored in the IC card 200 of Figs 1 and 2. The IC card 200 in the construction of Fig. 4 stores therein a bio execution condition table 201, a finger print bio mounting table 202-1, a voice print bio mounting table 203-1, a face bio mounting table 204-1, a finger print identification algorithm 205-1, a finger print oneself data 205, a voice print identification algorithm 206-1, a voice print oneself data 206, a face identification algorithm 207-1, and a face oneself data 207. Thus, the IC card 200 stores therein the finger print identification algorithm 205-1, the voice print identification algorithm 206-1, and the face identification algorithm 207-1 in addition to the data construction of Fig. 3.

**[0022]** The bio execution condition table 201 of Fig. 4 stores therein the above-described identification condition data. The finger print bio mounting table 202-1, the voice print bio mounting table 203-1, and the face bio mounting table 204-1 respectively store therein the data for mounting or not-mounting the finger print oneself data 205, the voice print oneself data 206 and the face oneself data 207, and the data representing if an identification process should be performed within the IC card 200.

**[0023]** These data consist of three values of [1] representing mounting of the corresponding bio data, [0] representing not-mounting of the corresponding bio data, and [-1] representing that the identification process employing the corresponding bio should be performed within the IC card 200.

**[0024]** The finger print identification algorithm 205-1, the voice print identification algorithm 206-1, and the face identification algorithm 207-1 respectively represent a finger print identification algorithm, a voice print identification algorithm and a face identification algorithm which employ finger print data, voice print data and image data corresponding to a face.

**[0025]** The finger print oneself data 205 is finger print data corresponding to a finger print of a particular finger of a user which is previously taken and registered from the user oneself. The voice print oneself data 206 is voice print data corresponding to a voice print of the user which is previously taken and registered from the user oneself. The face oneself data 207 is image data corresponding to a face image of the user that is previously taken and registered from the user oneself.

**[0026]** Thus, the IC card 200 in the construction of Fig. 4 stores therein algorithms for finger print identifica-



tion, voice print identification and face identification to execute finger print identification, voice print identification and face identification within the IC card 200.

**[0027]** Fig. 5 is a flow chart showing a personal identification operation in the personal identification device 100 wherein the data stored in the IC card 200 has the construction of Fig. 4.

**[0028]** Upon starting the personal identification operation, it is inquired if the IC card 200 held by the user is installed into the insertion opening 50 in a step 101. If the card 200 is not installed, a NO response is produced in the step 101 and the sequence returns to the step 101 to wait the installation of the IC card 200 into the insertion opening 50 of the personal identification device 100.

**[0029]** If it is confirmed in the step 101 that the IC card 200 held by the user has been installed into the opening 50, an YES response is produced in the step 101 and the data within the card 200 is read by the IC card R/W 70 in a step 102. A guidance as to the bio to be used for personal identification is displayed by the input-and-display panel 10 based on the contents of the bio execution condition table 201 in the data read from the IC card 200 in a step 103. Then, bio identification data is obtained from the user by driving the CCD sensor 20 for taking finger print data of a particular finger of the user, the microphone 30 for taking voice print data from the user, and the video camera 40 for taking image data of a face of the user in a step 104.

**[0030]** The sequence moves to an inquiry step 105 in which it is inquired if the bio mounting table shows internal designation, viz., the identification of the bio should be executed within the IC card 200, referring to the finger print bio mounting table 202-1, the voice print bio mounting table 203-1, and the face bio mounting table 204-1 among the data read from the IC card 200.

**[0031]** In this embodiment, if the contents of the finger print bio mounting table 202-1 shows [1], it shows mounting about the finger print bio data. If the contents show [0], it shows not mounting about the finger print bio data. If the contents show [-1], it shows that the identification process employing the finger print bio should be executed within the IC card 200.

**[0032]** If the contents of the voice print bio mounting table 203-1 show [1], it shows mounting about the voice print bio data. If the contents show [0], it shows not-mounting about the voice print bio data. If the contents show [-1], it shows that the identification process employing the voice print bio should be executed within the IC card 200.

**[0033]** If the contents of the face bio mounting table 204-1 shows [1], it shows mounting about the face bio data. If the contents show [0], it shows not-mounting about the face bio data. If the contents shows [-1], it shows that the identification process employing the face bio should be executed within the IC card 200.

**[0034]** Unless the bio mounting table is internal designation, viz., the identification of the bio is judged

not to be executed within the IC card 200 in the step 105, a NO response is applied to a step 106 in which the identification operation is executed by driving the identification algorithm at a terminal side, viz., at the personal identification device 100.

**[0035]** If the bio mounting table is internal designation, viz., the identification of the bio is judged to be executed within the IC card 200 in the step 105, an YES response is applied to a step 109 in which the bio identification data obtained from the user is transferred to the IC card 200. Then, the identification operation is executed by driving the identification algorithm at the IC card 200 in a step 110, and the result of the identification is applied to the terminal, viz., the personal identification device 100 in a step 111.

**[0036]** The sequence moves to an inquiry step 107 in which it is inquired if the plural designations have been finished in the bio-mounting table, viz., the identification operation employing all designated bio has been finished. Unless plural designations have been finished in the bio mounting table, viz., unless the identification operation employing all designated bio has been finished, a NO response is produced in the step 107 to be applied to the step 103 to repeat the operation from the step 103 to the step 107.

**[0037]** If it is confirmed in the step 107 that the plural designation have been finished in the bio mounting table, viz., the identification operation employing all designated bio has been finished, an YES response is applied to a step 108 in which the result of the identification is displayed by the input-and-display panel 10, and the sequence is finished.

**[0038]** The operation of the personal identification device 100 has been described above wherein the data stored in the IC card 200 employs the construction of Fig. 4. When the data stored in the IC card 200 employs the construction of Fig. 3, all identification operation is executed in the personal identification device 100, and the operation of the step 105 and the operation from the step 109 to the step 111 is omitted.

Fig. 1

Fig. 2

10\* input-and-display panel  
10-1\* LCD  
10-2\* touch panel  
20\* CCD sensor  
30\* microphone  
40\* video camera  
60\* peripheral controller  
70\* IC card R/W  
80\* memory  
90\* CPU  
200\* IC card  
300\* central device

Fig. 3

201 \* bio execution condition table  
 202 \* finger print bio mounting table  
 203 \* voice print bio mounting table  
 204 \* face bio-mounting table  
 205 \* finger print oneself data 5  
 206 \* voice print oneself data  
 207 \* face oneself data

Fig. 4

201 \* bio execution condition table 10  
 202-1 \* finger print bio mounting table  
 203-1 \* voice print bio mounting table  
 204-1 \* face bio mounting table  
 205-1 \* finger print identification algorithm 15  
 \* finger print oneself data  
 206-1 \* voice print identification algorithm  
 \* voice print oneself data  
 207-1 \* face identification algorithm 20  
 • face oneself data

Fig. 5

START  
 101 \* insert IC card? 25  
 102 \* read data within IC card  
 103 \* display guidance of designated bio  
 104 \* take bio identification data  
 105 \* bio mounting table shows internal designation? 30  
 106 \* drive identification algorithm at terminal side  
 107 \* plural designations are finished in bio-mounting table?  
 108 \* output identification result 35  
 109 \* transfer identification data to IC card  
 110 \* drive identification algorithm at IC card side  
 111 \* notify terminal of identification result  
 END 40

## Claims

1. A personal identification device (100) for executing personal identification by employing living body characteristics of an user, comprising 45
 

identification condition data reading means (70) for reading identification condition data specifying at least one living body characteristics stored in a portable storage media (200) carried by the user for the personal identification, 50

living body characteristic detecting means (20, 30, 40) for detecting from the user the living body characteristic corresponding to the identification condition data read by said identification condition data reading means, and 55

identifying means (90) for performing personal identification by comparing the living body characteristic detected by the living body characteristic detecting means with the living body characteristic data of users previously obtained.

2. A personal identification device according to claim 1 in which said portable storage media (200) stores therein an identification algorithm for personal identification employing said living body characteristics together with said living body characteristic data, and said identifying means (90) performs said personal identification by transferring said living body characteristics detected from the user by said living body characteristic detecting means (20, 30, 40) to said portable storage media (200).

3. A personal identification device according to claim 1 in which said portable storage media (200) stores therein said living body characteristic data, said identification condition reading means (70) reads said living body characteristic data from said portable storage media together with said identification condition data, and said identifying means (90) performs said personal identification by comparing said living body characteristics detected from the user by said living body characteristic detecting means (20, 30, 40) with said living body characteristic data read from said portable storage media (200).

4. A personal identification apparatus for performing personal identification by employing living body characteristics of a user having a central device (300), and a plurality of personal identification terminals (100), each of said personal identification terminals (100) comprising

identification condition data reading means (70) for reading identification condition data specifying at least one living body characteristics stored in a portable storage media (200) carried by a user,  
 living body characteristic detecting means (20, 30, 40) for detecting from said user the living body characteristic corresponding to the identification condition data read by said identification condition data reading means (70),  
 identifying means (90) for performing personal identification by comparing the living body characteristic detected by said living body characteristic detecting means (20, 30, 40) with the living body characteristic data of users obtained previously, and  
 communicating means (301, 60) for communicating with said central device (300).

5. A personal identification apparatus according to claim 4 in which said portable storage media (200) stores therein an identification algorithm for personal identification employing said living body characteristics together with said living body characteristic data, and said identifying means (90) performs said personal identification by transferring said living body characteristics detected from the user by said living body characteristic detecting means (20, 30, 40) to said portable storage media (200).

6. A personal identification apparatus according to claim 4 in which said portable storage media (200) stores therein said living body characteristic data, said identification condition data reading means (70) reads said living body characteristic data from said portable storage media (200) together with said identification condition data, and said identifying means (90) performs said personal identification by comparing said living body characteristics detected from the user by said living body characteristic detecting means (20, 30, 40) with said living body characteristic data read from said portable storage media (200).

7. A personal identification apparatus according to claim 4, in which said central device (300) stores and manages said living body characteristic data for each user, revises said living body characteristic data for each user stored and managed by communication with each of said personal identification terminals (100), and generally controls identification results of users from said personal identification terminals (100).

8. A personal identification method for detecting living body characteristics of a user to compare the detected characteristics with the living body characteristic data previously obtained about the user to execute personal identification, comprising the steps of

storing identification condition data specifying at least one living body characteristics for the personal identification into a portable storage media (200) carried by the user and detecting living body characteristic corresponding to the identification condition data read from said portable storage media from the user to execute the personal identification.

9. A personal identification method according to claim 8 further comprising the steps of

storing into said portable storage media (200) an identification algorithm for personal identification employing said living body characteris-

tics together with said living body characteristic data, and transferring the living body characteristic detected from said user to said portable storage media (200) for personal identification.

10. A personal identification method according to claim 8 further comprising the steps of

storing said living characteristic data into said portable storage media (200), and comparing the living body characteristics detected from said user with said living body characteristic data read from said portable storage media (200).

Fig. 1

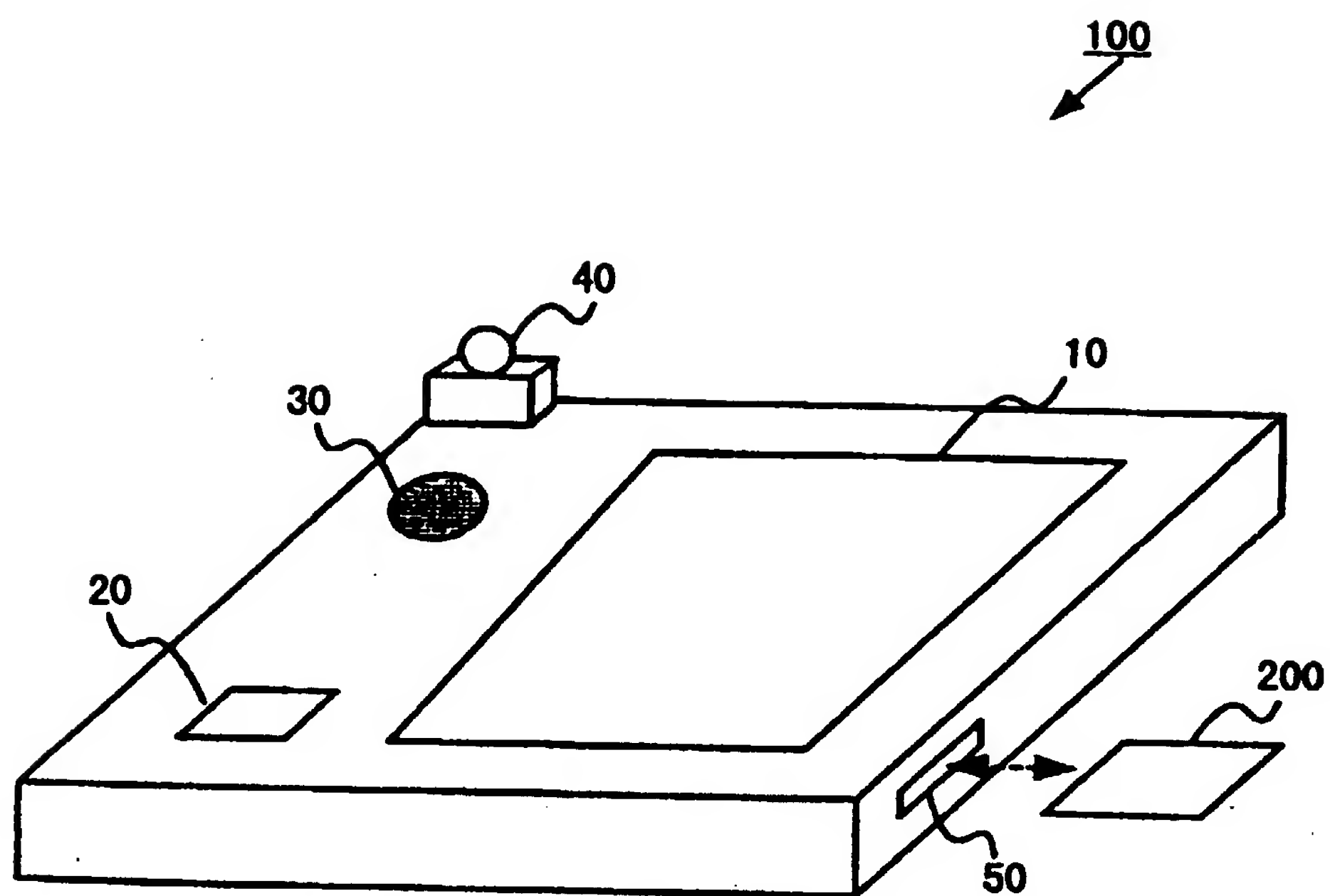




Fig. 2

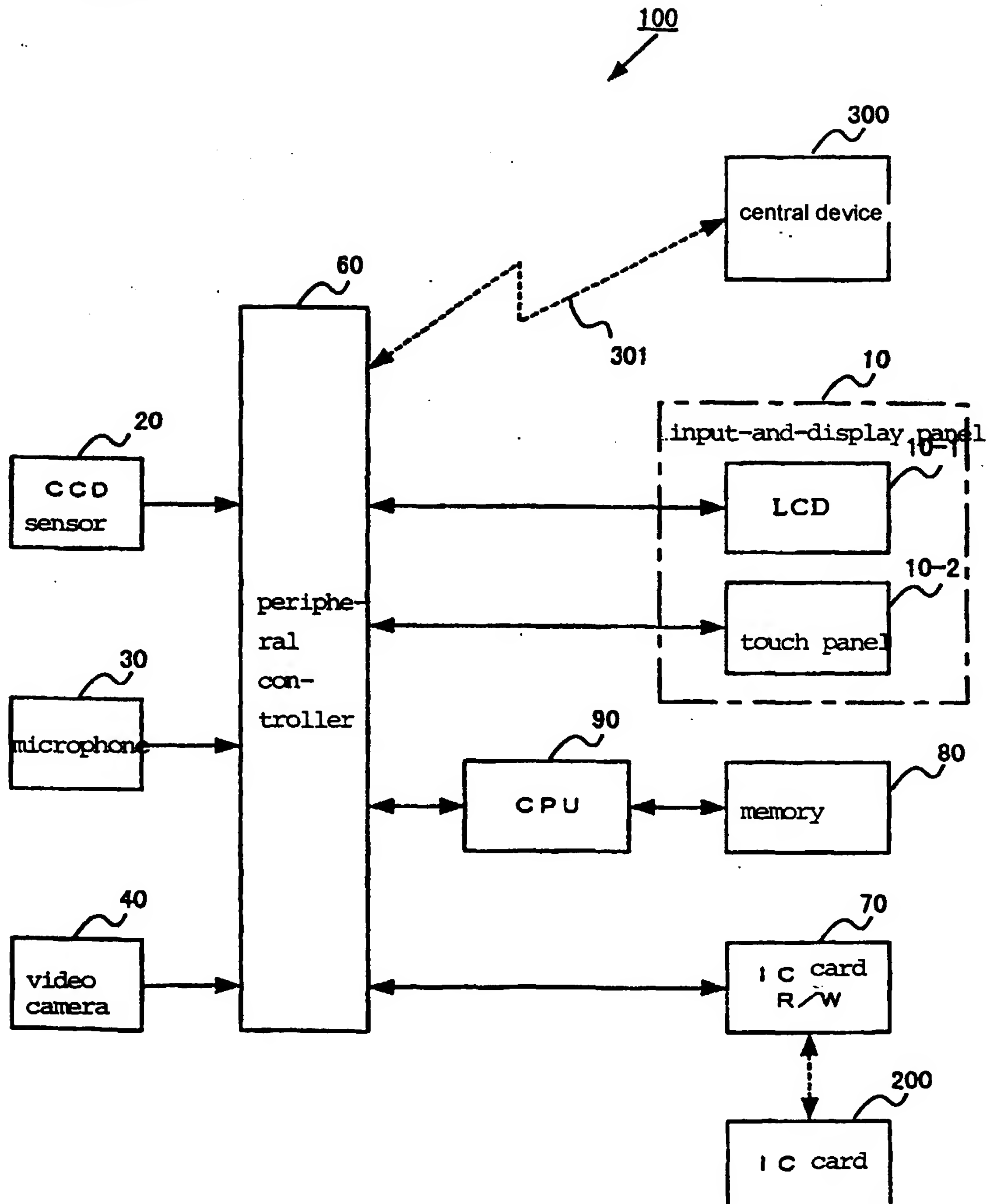


Fig. 3

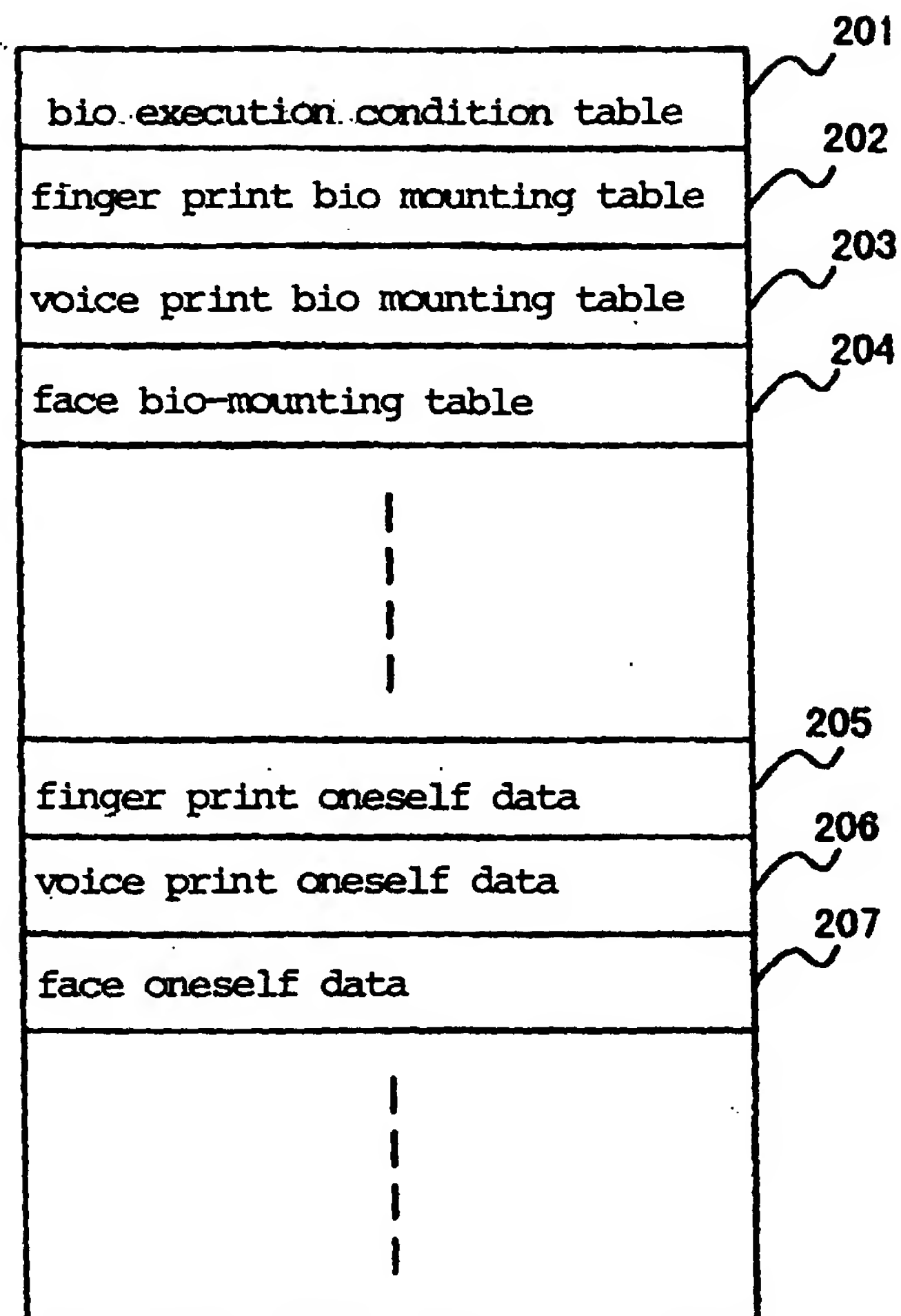


Fig. 4

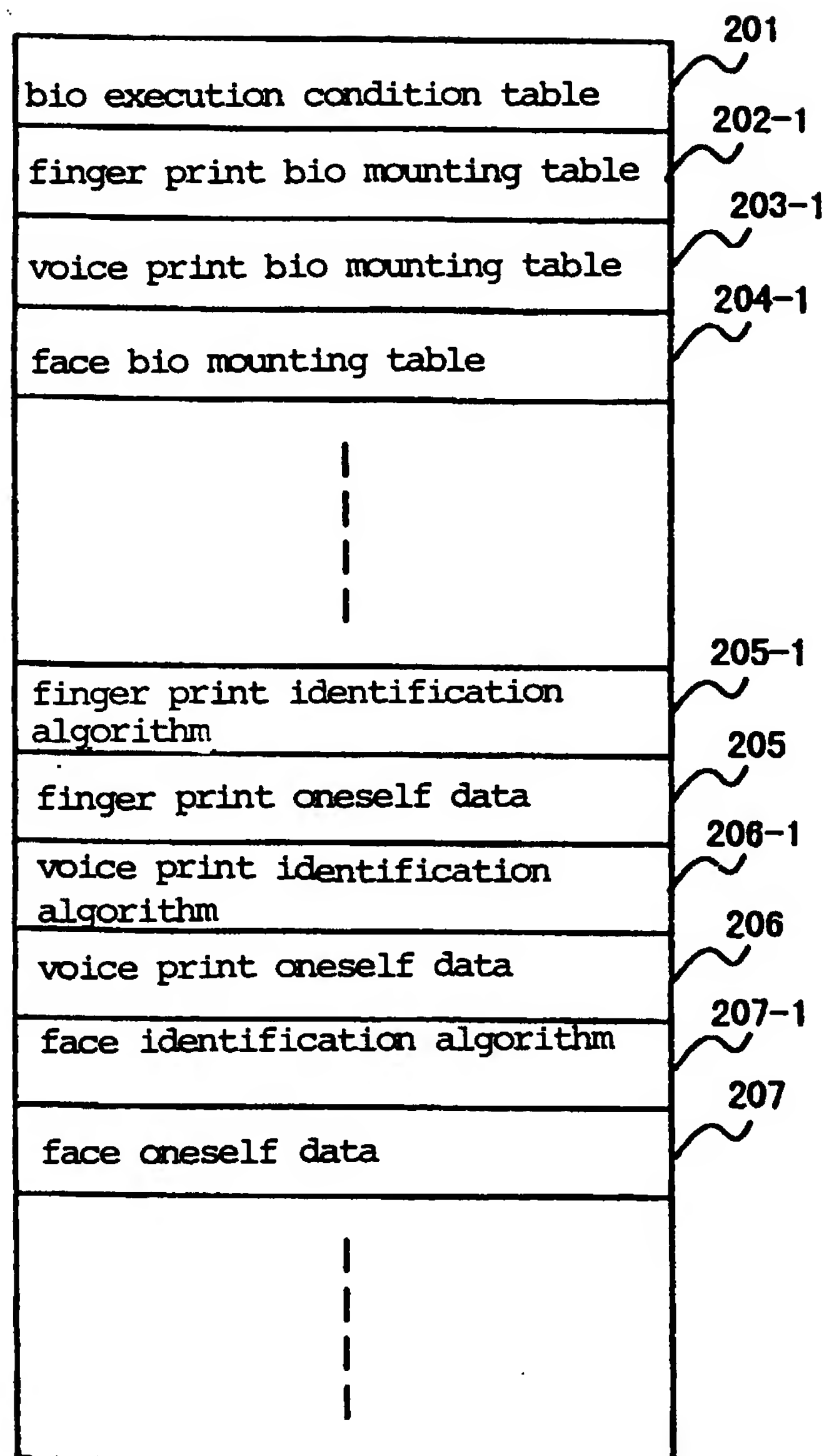


Fig. 5

